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Take the money and run? Implementation and disclosure of environmentally-oriented crowdfunding projects

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ABSTRACT

This article deals with environmentally-oriented crowdfunding projects. Drawing on agency-theory, it analyses the implementation of such projects, after they have been successfully financed via-crowdfunding. More specifically, this article firstly investigates whether environmental ventures implement the measures they have advertised during the crowdfunding campaign. Secondly, it examines in how far environmentally-oriented ventures disclose the environmental benefits that have been created based on the implementation of the measure financed via crowdfunding. It thereby uses data gained from a platform specialized in funding projects that serve combatting climate change. The results show that the measures advertised are commonly implemented. However, only few projects disclose information on the actual environmental benefits created. Thus, funders are unable to evaluate whether the environmental benefits advertised during the crowdfunding campaign are actually realized.

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1. Introduction

The potential of entrepreneurial ventures to contribute to sustainable development has increasingly been highlighted in research and has stimulated a vivid debate (e.g. Melay and Kraus, 2012; Fellnhofer et al., 2014; de Lange, 2017; Gast et al., 2017). With crowdfunding, a new mechanism of financing has emerged, which is frequently expected to help unleash this potential (e.g. Hemer, 2011; Bartenberger and Leitner, 2013; Lam and Law, 2016). Crowdfunding describes "the efforts by entrepreneurial individuals and groups – cultural, social, and for-profit – to fund their ventures by drawing on relatively small contributions from a relatively large number of individuals using the internet, without standard financial intermediaries" (Mollick, 2014, p. 2). It experiences a rapid global growth and is expected to reach a global volume of US$ 90 billion by 2020 (Scott-Briggs, 2017).

First empirical studies show that crowdfunding can indeed be used to finance environmentally-oriented projects and that environmental orientation can even increase crowdfunding success (Calic and Mosakowski, 2016; Vasileiadou et al., 2016). However, to successfully contribute to sustainable development, it is not sufficient that ventures which aim at creating positive environmental effects are successfully financed via crowdfunding. Additionally, it is required that these ventures are actually implemented and thus create and document the environmental effects achieved after being funded. As usually no sanctions apply if entrepreneurs who have successfully financed a project via crowdfunding do not realise the advertised measure (Lehner, 2013; Mollick, 2014), the implementation of projects financed via crowdfunding cannot be taken for granted. This article therefore analyses the post-funding phase of crowdfunding, i.e. the implementation of projects and the disclosure of their environmental effects after these projects have been successfully funded via crowdfunding.

In so doing, this research uses empirical data of a platform specialised on projects which aim at combatting climate change. The context of climate change was selected, as climate change has been identified as one of the most pressing environmental problems (Rietbergen et al., 2015; Steffen et al., 2015). Therefore, it is unsurprising that Branzei et al. (2017) raise the question as to how crowdfunding can support climate action. Furthermore, climate change is a context worth studying, as contributions to climate change are clearly measurable and quantifiable, in contrast to other sustainability-related phenomena such as biodiversity or forced labour.

The analysis builds on agency theory because agency theory can inform the decision-making of funders and entrepreneurs prior to

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and after the investments have been made (Jensen and Meckling, 1976). Currently, the common assumption that crowdfunding can substantially contribute to sustainable development is primarily based on conceptual works (e.g. Hemer, 2011; Bartenberger and Leitner, 2013; Lam and Law, 2016) as well as on empirical analyses of the pre-funding phase (e.g. Calic and Mosakowski, 2016; Hörisch, 2018; Vismara (2019)). Thus, the debate on crowdfunding and sustainability runs the risk of under- or overestimating the contribution of crowdfunding to sustainable development, as no realistic assessment of its actual contribution to the solution of environmental problems exists. Analysing whether projects financed via crowdfunding actually implement the advertised measure and in how far the actual environmental effects achieved by this implementation are disclosed is therefore of utmost importance.

Besides the implementation of environmental projects financed via crowdfunding, this article analyses the disclosure of information on the environmental benefits created by these projects. Disclosing information on the implementation of projects has been identified as a crucial means to increase transparency in crowdfunding (Baucus and Mitteness, 2016; Cumming et al., 2017). Generally, environmental disclosure is a precondition for evaluating the actual environmental effects caused by an organisation (Wang et al., 2004). Therefore, documenting what information environmentally-oriented ventures financed via crowdfunding disclose in the post-funding phase is an important first step in evaluating the contribution of crowdfunding to sustainable development. Consequently, this article addresses the following research questions (RQ):

RQ1: *Do environmentally-oriented ventures financed via crowdfunding implement the measure advertised during the crowdfunding campaign?*

RQ2: *What information on the actual effects created do environmentally-oriented ventures financed via crowdfunding disclose in the post-funding phase?*

In addressing these research questions, this article contributes to the growing research stream on crowdfunding and sustainability (Bocken et al., 2014; Hörisch, 2015; Vasileiadou et al., 2016). For the first time, the implementation and disclosure of implementation-information in the post-funding phase is analysed for environmentally-oriented crowdfunding projects. The results show that the measures advertised are commonly implemented. However, only few projects disclose information on the actual environmental benefits created.

The remainder of the article is structured as follows: The next section summarizes the extant literature in the field and introduces the theoretical framework of agency theory. Section 3 describes the research methodology applied. The results of this analysis are presented in section 4. Section 5 discusses these findings against the background of prior research as well as agency theory and draws practical implications for entrepreneurs, crowdfunders and policy makers. In section 6, the contribution of this article to the wider research field is evaluated and conclusions for further research are drawn.

2. Literature review

2.1. Research gaps in crowdfunding for sustainable ventures

Crowdfunding literature differentiates four types of crowdfunding, depending on the type of return funders receive (Lehner, 2013; Mollick, 2014; Fleming and Sorenson, 2016): With donation-based crowdfunding, funders do not receive any returns. In contrast, in reward-based crowdfunding, funders obtain material rewards (such as products or services). With equity crowdfunding, also known as equity-based crowdfunding or crowdinvesting, funders receive a financial return in form of a share of the profits. Lastly, in debt crowdfunding (also known as loan-based crowdfunding or crowdlending) the amount invested is repaid to an a priori defined interest rate. Prior research in the field of crowdfunding and sustainability nearly exclusively focused on reward-based crowdfunding (e.g. Pitschner and Pitschner-Finn, 2014; Hörisch, 2015; Calic and Mosakowski, 2016). This focus surprises, given that debt crowdfunding makes up 72.6% of the global crowdfunding market (Leboeuf and Schwienbacher, 2018) and shows the strongest market-growth (Fleming and Sorenson, 2016). Additionally, earlier research argues that different types of crowdfunding suit different purposes best (Meyskens and Bird, 2015; Hörisch, 2018). Based on these findings, it can be expected that particularly for those sustainable ventures which do not create material rewards (such as ventures aiming at reducing greenhouse gas emissions), equity and debt crowdfunding bear the largest potential. Therefore, this research focuses on debt crowdfunding.

Besides the focus on reward-based crowdfunding, Bartenberger and Leitner (2013) as well as Lehner (2013) identify a second research gap, as most research in the context of crowdfunding and sustainability is conceptual, but only few quantitative analyses have been conducted so far and empirical evidence is still lacking (Bruton et al., 2015). Third, and maybe most importantly, extant empirical research on sustainability and crowdfunding exclusively focuses on the phase of crowdfunding prior to funding (i.e. the crowdfunding campaign aka pre-funding phase). This body of research primarily analyses determinants that influence whether a crowdfunding campaign reaches its funding target (e.g. Calic and Mosakowski, 2016; Hörisch, 2018; Vismara (2019)). Concerning the general motivation of crowdfunders to contribute to a project, different rationales have been found in earlier studies. Dorfleitner et al. (2016) argue that funders make their investment decisions in a relatively rational and efficiency-oriented manner. Similarly, Cholakova and Clarysse (2015) find that nonfinancial motives do not play a significant role in crowdfunding. In contrast, Allison et al. (2015) demonstrate for the context of debt crowdfunding that projects with a stronger emphasis on their social impact reach their funding target faster. Galak et al. (2011) argue that crowdfunders follow a hybrid logic, which unites rationales of conventional investors (such as profit-seeking) with the motivation to help others. Likewise, Ly and Mason (2012) as well as Dorfleitner and Oswald (2016) identify financial as well as altruistic motives among funders on the debt crowdfunding platform Kiva.

While the above-summarized studies all address the pre-funding phase, only few studies investigated the implementation of successfully funded crowdfunding projects and the documentation of the effects they created in the post-funding phase. Generally, environmentally-oriented crowdfunding projects aim at realising two types of effects. First, crowdfunding projects create an *economic effect for the individual funders*. In debt- and equity-crowdfunding this is reflected in the delivery of financial returns to the individual funders. In reward-based crowdfunding, the delivery of the (material) rewards can be considered as the economic effect. Second, environmentally-oriented crowdfunding projects aim at creating *environmental effects to the general public*, i.e. the implementation of the respective project should result in an environmental relief. So far, research on the post-funding phase has only dealt with the economic effects created by crowdfunding projects. Mollick (2014) for instance analyses whether the rewards advertised in reward-based crowdfunding campaigns were actually delivered. He finds that while 96.4% of projects deliver the rewards, delivery is delayed in 75% of the cases. Mollick and Kuppuswamy (2014) show that more than 90% of all successfully funded ventures are still in business one to four years after funding. Dorfleitner

and Oswald (2016) analyse determinants on the expected default frequency in debt crowdfunding and find that loan period and amount influence default frequency, as do demographic variables. Overall, they observe that 98.8% of all projects funded on the social crowdfunding-platform Kiva repay their loans.

It remains open for further investigation, however, whether these findings on the delivery of economic effects in the post-funding phase, described for the context of non-sustainability-oriented crowdfunding projects, can similarly be found for environmentally-oriented crowdfunding. To the best knowledge of the author, no studies have so far addressed the environmental effects caused by environmental ventures successfully financed via crowdfunding or the disclosure of these effects. Against this background, Bruton et al. (2015) as well as Vasileiadou et al. (2016) identify need for further research which analyses the non-financial effects of crowdfunding, such as the effects on sustainable development. Likewise, Vismara (2019) highlights for the case of sustainability-oriented crowdfunding projects that "its chances of long-term success are an important topic for future research". Most explicitly, in a recent overview article on sustainability and crowdfunding, Messeni Petruzzelli et al. (2018, p. 9) state that "scholars have only recently started to investigate the multiple consequences of crowdfunding campaigns in terms of their immediate effects on the project creator's ability to actually complete the project" and motivate future research investigating the impact of crowdfunding for sustainability-oriented projects (Messeni Petruzelli et al. 2019, p. 9).

2.2. Theoretical background

This article addresses the above identified research gaps and analyses the post-funding phase of crowdfunding. It thereby builds on agency theory, which deals with constellations where a *principal* assigns an *agent* a specific task, under the influence of informational asymmetries for the benefit of the agent (Jensen and Meckling, 1976; Eisenhardt, 1989; Lozano et al., 2015). Agency theory has previously been applied to situations where investors (principals) have only limited influence on the entrepreneurs (agents) decision-making after investment (Arthurs and Busenitz, 2003; Cumming, 2005). For example, Chen et al. (2008) showed that borrowers of bank loans have incentives for opportunistic behaviour in the form of 'take the money and run' logics, which creates market imperfections and inefficiencies (cf. Jensen and Meckling, 1976). A key cause of market imperfections assumed in agency theory is adverse selection, i.e. the tendency that primarily agents unwilling or unable to perform a specific task as intended by the principal are entering a market (Mankiw and Taylor, 2011). From an agency theory perspective, problems of adverse selection can be expected in crowdfunding. The funders have only limited information concerning the agents, which would allow investors to judge whether the agent really intends to invest the money obtained for the specific purpose and possesses the necessary capabilities to implement the respective project. Consequently, Lam and Law (2016) emphasize that informational asymmetries are more important for crowdfunding than for other mechanisms of financing. Comparing different types of crowdfunding, Vismara (2019) specifies that informational asymmetries will be less relevant for reward-based crowdfunding, as funders might not necessarily be interested in the long-term prospects of the company. This implies that for debt (and equity) crowdfunding were long-term interest rates are paid to funders, informational asymmetry will be particularly relevant.

Additionally, agency theory suggests that *moral hazard* comes to play in crowdfunding. The concept of moral hazard assumes opportunistic behaviour of the agent if no sanctions apply (Eisenhardt, 1989). Indeed, most crowdfunding platforms do not apply sanctions in case that the entrepreneurs do not implement the project advertised in the pre-funding phase, as problematized for instance by Lehner (2013) and Mollick (2014). Consequently, in a SWOT analysis of sustainability-oriented crowdfunding, Zeco and Propfe (2014, p. 21) identify the potential weakness that entrepreneurs could misuse crowdfunding "in order to receive funding, claim it as a salary and then close down". Thus, based on agency theory and earlier conceptual research on crowdfunding, it can be assumed that a large share of environmentally-oriented crowdfunding projects do not implement the measure they advertised. However, first empirical results from reward-based and debt crowdfunding show that fraud is relatively rare, as rewards are usually delivered in reward-based crowdfunding (though frequently delayed, Mollick, 2014) and loans are usually repayed in debt-crowdfunding (Dorfleitner and Oswald, 2016).

Agency theory also suggests that even if an environmentally-oriented project financed via crowdfunding is implemented (i.e. the money is invested in the measure advertised during the crowdfunding campaign), this does not mean that implementation also results in the environmental and financial effects advertised in the pre-funding phase and that the realization of these effects is disclosed. This can be explained by the lack of incentives to put sufficient effort in the implementation of the measure and to document the resulting effects to funders, as the funding has already been received (cf. Jensen and Meckling, 1976). One mechanism which can push agents towards realising and disclosing the effects as advertised is regulation, if it creates sanctions for non-compliance (Malik, 1993). However, such regulation in the context of crowdfunding is considered relatively weak, as it sets only little requirements for entrepreneurs to disclose information about their performance in the post-funding phase (Aschenbeck-Florange et al., 2013; Zeco and Propfe, 2014).

If the incentives to realise the effects advertised during the crowdfunding campaign and to disclose them are compared for environmental and for financial effects, substantial differences become evident. While the requirements to meet financial obligations towards investors are lower than for other means of financing (Aschenbeck-Florange et al., 2013; Zeco and Propfe, 2014), still regulation exists, which sets respective requirements. In the US, crowdfunding is regulated by the JOBS act (Stemler, 2013; Zeco and Propfe, 2014). In many European companies, debt crowdfunding is commonly organised using subordinate loans, which provides only a relatively weak level of protection to investors, but still sets some binding rules (Aschenbeck-Florange et al., 2013). Therefore, crowdfunders who do not receive their financial returns will be likely to sue the entrepreneur. This is particularly probable because crowdfunders are affected by a non-delivery of financial returns directly, as financial returns are a private good. For the same reason, it can be expected that crowdfunders will demand entrepreneurs to document their ability to deliver financial returns. This demonstrates that with regard to the financial returns advertised by crowdfunding initiators, the problem of moral hazard does not fully apply, as crowdfunders can observe whether entrepreneurs deliver the returns, are personally affected by non-delivery and are likely to use the available means to sanction non-delivering entrepreneurs.

In contrast, no specific regulation concerning the realisation of environmental effects advertised during crowdfunding campaigns exists. Additionally, funders are usually not personally affected by a non-delivery of environmental effects, as these are public goods (cf. Perman et al., 2003). Thus, they might not follow up whether these effects are actually realized in the post-funding phase or might even not recognise non-delivery. In contrast non-delivery of financial returns is directly affecting funders. Therefore, funders might be less likely to monitor whether the advertised

environmental effects are indeed realized and will not demand documentation of these effects caused by the venture to the same degree as for financial effects. Frequently, it will even be difficult for funders to examine whether the environmental effects have been realised as advertised because environmental effects are observable and quantifiable for investors only to a lesser extent if compared to financial effects (cf. Williams et al., 2009). As Eisenhardt (1989) proposes, in such situations agency problems are frequent, as the principals have only little information to verify an agents behaviour, and the agent is thus less likely to act in the interest of the principals. This suggests that with regard to environmental effects, adverse selection, informational asymmetries and moral hazard are more likely to apply than with regard to financial effects.

Baucus and Mitteness (2016) as well as Cumming et al. (2017) stress the importance of documenting the implementation of the projects funded via crowdfunding in order to increase transparency. Consequently, disclosing whether or not the effects advertised during the crowdfunding campaign are actually realized in the post-funding phase is an important first step in evaluating the contribution of crowdfunding to sustainable development. Similarly, Wang et al. (2004) highlight that disclosure is a precondition for evaluating the actual environmental effects an organisation causes. Consequently, hypothesis 1 focuses on the disclosure of financial and environmental effects and potential differences between these effects concerning the level of disclosure:

H1: Environmental ventures financed via crowdfunding are more likely to disclose information on financial effects than environmental effects in the post-funding phase.

3. Method

3.1. Data

The data used for this research is gained from Bettervest, a German-based crowdfunding platform, which also funds international projects. It uses a debt-based crowdfunding mechanism. This allows overcoming the focus on reward-based crowdfunding in prior research. Bettervest is one of the first crowdfunding platforms which specialised in funding projects that combat climate change. Funders provide ventures with capital, which is usually invested in improving energy efficiency or in the production of renewable energy. If a project is financed successfully, an annual interest rate is paid to funders (for a time span of approximately 3–10 years). Thus, to attract funders, entrepreneurs on Bettervest do not only advertise financial effects (i.e. the interest-rate funders will receive if the project is successfully funded), but also environmental effects, i.e. the amount of greenhouse gas emissions reductions in tonnes of CO_2-equivalents, which is expected to be achieved by the implementation of the respective measure. If a project is successfully funded, the entrepreneurs document its implementation on the platform to registered users of Bettervest by providing evidence that the money raised has been spent on the measure advertised. This can be done for instance by uploading the energy bills prior and after the implementation of the respective project, which also allows assessing the level of environmental effects achieved, or by simply uploading photographs of the respective construction work taking place.

This goes to show that projects funded on Bettervest aim at delivering two types of effects, i.e. financial returns to the investors and environmental effects to the general public. Therefore, for each project two observations can be made in this analysis: One concerning the delivery of financial effects and one concerning the delivery of environmental effects. The sample draws on all 58 projects which have so far been successfully funded on Bettervest (as of 1st November 2017) and therefore includes 116 observations. However, one project, which aimed at financing the platform Bettervest itself, did not advertise to create direct environmental effects. Thus, the sample size is 115 observations (58 observations concerning financial effects and 57 observations concerning environmental effects) drawing on 58 projects. Compared to earlier research on sustainability-oriented crowdfunding projects, this is within the usual range of sample sizes which includes smaller (e.g. Manning and Bejarano, 2017; Hörisch, 2018) as well as larger samples (e.g. Calic and Mosakowski, 2016). Furthermore, the sample size clearly exceeds the minimum sample size of 30 subjects required for applying Generalized Estimating Equations (Ghisletta and Spini, 2004), the technique used in this article. The analysis exclusively focuses on successfully financed projects, as only for these projects it can be expected that the measure advertised will be implemented.

Germany has been selected as the geographic context for this study, as using data from a European country allows addressing the need for more studies on crowdfunding from non-US or other English-speaking contexts, identified by Fleming and Sorenson (2016) as well as by Allison et al. (2013). Furthermore, in Germany the amount funded per capita via crowdfunding is closer to the European average than for other large European economies (cf. DouwEnKoren, 2015).

3.2. Measures and analysis

To assess the implementation of the crowdfunding projects, these were coded as implementing if the money raised has been spent on the measure advertised during the crowdfunding campaign and respective information has been published on Bettervest. In contrast, if information on failure to spend the money on the measure advertised or on the insolvency of the venture was published, projects were coded as 'non-implementing'. For two projects no information on implementation or non-implementation was provided.

To capture disclosure, a binary variable was set up, which indicates whether (DISCL = 1) or not (DISCL = 0) information concerning the realisation of the advertised financial and environmental effects is disclosed on Bettervest. For instance, to disclose information on financial effects, some projects funded on Bettervest indicate whether the interest rates are paid to funders or provide information on the current creditworthiness of the project as an indicator of their ability to pay the interest rates in future. Likewise, to disclose information on the realisation of environmental effects, projects can for instance document the reductions in energy use achieved or the amount of renewable energy produced.

To be able to evaluate whether information on financial effects are disclosed systematically more often than information on environmental effects, the variable TYPEE was set up. This variable differentiates the two types of effects analysed in this article. It takes the value of 1 if the observation refers to an environmental effect of a given project and the value of 0 if the respective observation refers to a financial effect.

Prior analyses on non-environmentally-oriented crowdfunding projects or on agency theory in general suggest that further variables can influence the post-funding phase in crowdfunding of the projects. These variables have hence been included as control variables. First, the duration of the loan can influence the outcomes of debt-crowdfunding projects (Dorfleitner and Oswald, 2016). Therefore, the analysis controls for the duration (DURA) of the loan (measured in years). Similarly, the time elapsed since the crowdfunding campaign might influence the likelihood that the measure advertised is already implemented and that the environmental and financial effects created are disclosed. Consequently, time elapsed

since the crowdfunding campaign (TIME) is included as a control variable (measured in months passed since funding).

Table 1 summarizes the operationalisation of the variables and provides descriptive statistics as well as a correlation matrix. As for each project two observations are included in the dataset, the observations are not unrelated to each other. The observation on disclosure of financial effects for a given project is related to the observation on the disclosure on environmental effects concerning this project, because both refer to the same project. Therefore, to assess hypothesis 1, generalized estimating equations were employed using SPSS 25. This technique was introduced by Liang and Zeger (1986) and allows analysing whether some observations (in case of this article the observations concerning environmental effects of crowdfunding projects) differ significantly from other observations (those on financial effects concerning the respective projects) (Hardin and Hilbe, 2002). According to Ghisletta and Spini (2004), the minimum sample size for Generalized Estimating Equations is 30 subjects, which is clearly exceeded for this analysis.

4. Results

A first descriptive analysis reveals that 52 of the 58 project successfully funded implemented the measure advertised during the crowdfunding campaign, while four projects did not implement the measure advertised and two did not provide information on implementation, i.e. 92.9% of the projects for which information on implementation was available implemented the project.

As pointed out in the development of hypothesis 1, the implementation of a measure financed via crowdfunding does, however, not automatically imply that this implementation will cause the environmental and financial effects advertised during the crowdfunding campaign. Therefore, disclosing information on the effects actually achieved in the post-funding phase is of utmost importance. The hypothesis expects that environmental ventures successfully funded via crowdfunding are more likely to disclose information on the realization of the financial effects advertised than on the realization of environmental effects. To test this hypothesis, generalized estimating equations were used, containing both the observations on the environmental and on the financial effect for each crowdfunding project (Table 2).

First, a model including only the control variables was set up (model 1). In model 2, additionally the variable differentiating between financial and environmental effects has been added (TYPEE). As indicated by the lower values of QIC and QICC for model 2 when compared to model 1, the addition of the TYPEE variable (type of effect) improves the explanatory power of the model. As indicated by the positive significant coefficient of TYPEE = 0 in model 2, the disclosure of information on the actual effects achieved is significantly higher for financial effects than for economic effects. To test the robustness of this finding, an additional model 3 has been set up which excludes the control variable on the time passed since funding (TIME). As in model 2, TYPEE exerts a significant, positive effect, thus confirming the finding that the disclosure of environmental information is significantly lower than that of financial information. Thus, hypothesis 1 can be confirmed. Of the control variables, duration of the loan (DURA) exerts a significant (positive) influence on the disclosure of information regarding the effects achieved in all three models. This indicates that projects with longer durations of repayments are more likely to disclose information in the post-funding phase.

These findings show that most ventures do not disclose information on the environmental effects of implementing the project financed via crowdfunding. Overall, 17 of 57 projects which advertised environmental effects disclosed information on these effects in the post-funding phase. Interestingly, in only two of these cases was the information provided of quantitative nature (i.e. energy bills before and after the implementation of the measure financed via crowdfunding). Based on the documents these two projects provide, it needs to be assumed that they did not achieve their quantitative energy reduction targets: The actual energy consumption in the post-funding phase was higher than the energy consumption which was advertised during the crowdfunding campaign to be achieved after implementation (but still lower than the energy consumption before the implementation of the measure). For the remaining 15 projects providing information on environmental effects in the post-funding phase, only qualitative information was provided, so the amount of the environmental effects actually realised was not documented.

5. Discussion

Earlier research showed that crowdfunding is suitable for financing environmentally-oriented ventures (Calic and Mosakowski, 2016; Hörisch, 2018). This research complements this knowledge by providing first empirical insights on the post-funding phase of environmentally-oriented crowdfunding projects. It reveals that the vast majority of projects use the money raised for implementing the climate change measures advertised and implement this measure after successful funding. Therefore, the results of this article do not confirm the potential weakness of crowdfunding for sustainability Zeco and Propfe (2014) identify, i.e. that funders do not invest the money raised in the measure advertised during the crowdfunding campaign. The share of projects which indeed implement the measures advertised (92.9%) is largely in line with earlier analyses in the context of (non-sustainability-related) reward-based crowdfunding (96.4%; Mollick, 2014). Likewise, in the context of pro-social debt crowdfunding, Dorfleitner and Oswald (2016) found that 98.8% of all projects funded on the platform Kiva repay their loans. They furthermore analyzed the determinants of default frequency and found that the loan period influences default frequency. Similarly, the results of this article suggest that projects with longer loan periods are more likely to disclose information on the actual environmental and financial effects of the respective measure financed via crowdfunding.

In contrast to earlier studies on the post-funding phase in crowdfunding, this article not only provides insights on the disclosure and realisation of financial, but also of environmental effects. Thereby, clear differences between the disclosure of

Table 1
Descriptive statistics and correlation matrix.

Variable	Description	N	Mean	SD	1	2	3	4
(1) TYPEE	Type of effect (1 = observation refers to environmental effect)	115	.496	.502	1			
(2) DISCL	Information on realisation of effect disclosed (1 = yes)	115	.583	.495	−.572**	1		
(3) DURA	Duration of loan in years	115	6.548	1.827	−.002	−.168	1	
(4) TIME	Months passed since funding	113	21.690	14.333	−.001	−.021	−.079	1

The cells provide correlation coefficients; *p < 0.05, **p < 0.01.

Table 2
Generalized Estimating Equations on the disclosure of the effects of crowdfunding projects.

Dep. Variable	DISCL	DISCL	DISCL
Model	1	2	3
Main effect			
TYPEE (0 = observation refers to financialeffect)	/	2.774** (.536)	2.819** (.534)
Controls			
TIME	−.001 (.012)	.001 (.017)	/
DURA	.198** (.069)	.313** (.091)	.308** (.086)
Constant term	−.915 (.588)	−2.942** (.802)	−2.914** (.600)
Model Summary			
N	113	113	115
QIC	153.333	117.014	116.057
QICC	156.036	118.078	117.209

**p < 0.01; *p < 0.05; Unstandardized regression coefficients are reported; Standard errors are reported in brackets.

information on financial effects on the one hand and environmental effects on the other hand are observed since disclosure on environmental effects is significantly less common. Different possible ways to document the quantity of environmental effects achieved exist for environmental ventures using Bettervest (e.g. uploading energy bills showing the amount of energy consumption before and after the implementation; documenting the feed in of renewable energy to the grid). However, these possibilities are used by only a small share of the projects. Generally, the disclosure concerning environmental effects is low and primarily of qualitative nature. Thus, environmentally-oriented crowdfunding projects do not disclose sufficient information to allow evaluating the realization of the environmental effects advertised (cf. Wang et al., 2004) and funders do not possess the information necessary to assess whether the environmental effects envisaged by the projects they funded are actually achieved. This finding points to a potential problem related to the contribution of crowdfunding to sustainable development, as, on the basis of agency theory, Eisenhardt (1989) proposes that in situations where the principals have only little information to verify whether an agent acts according to the interest of the principals, the agent is unlikely to do so.

Different possible explanations for the low levels of disclosure concerning environmental effects exist. *First*, it could be assumed that most crowdfunding projects with environmental aims do not achieve these aims once they are successfully funded and are hence reluctant to disclose their failure to meet the aims advertised during the crowdfunding campaign. This explanation would be in line with earlier research on corporate sustainability, which argues that corporations with weak environmental performances are reluctant to disclose this performance (Gao and Connors, 2011) and would imply that the project initiators purposively do not provide information on the environmental effects realised, as they fear negative consequences of such disclosure. Similarly, Cho and Kim (2017) found that providing detailed information during the crowdfunding campaign about how the money received should be used can be detrimental for a project's funding success. *Second*, the results could alternatively be interpreted in a way that projects do not document the realisation of environmental effects in detail because crowdfunders do not request such detailed disclosure or any disclosure at all. This in turn would be in contrast to research on corporate sustainability reporting, which documented that investors form the groups of stakeholders who consume sustainability information provided by sustainability reports most frequently (e.g. Herzig and Schaltegger, 2006). Additionally, such interpretation would imply that while environmental orientation is an important factor affecting funders' decision to fund a project (cf. Calic and Mosakowski, 2016), in the post-funding phase even funders on an environmentally-oriented platform do not call in crowdfunding projects to disclose the achievement of the environmental effects advertised in the pre-funding phase.

The findings of this article can also be discussed against prior literature on the rationales underlying crowdfunding. The finding that most projects disclose information on the realization of financial effects but fall short with regard to the provable realization of environmental effects can be interpreted as indication that the rationales dominant in crowdfunding are quite similar to those of conventional investors, i.e. financial returns are put first and decision-making is not dominated by altruism. This is in line with earlier findings that crowdfunders are likely to act rather similarly to conventional investors (e.g. Dorfleitner et al., 2016) and put financial motives first (e.g. Cholakova and Clarysse, 2015), as crowdfunders do not seem to demand disclosure concerning the environmental effects. In contrast, researchers such as Lindenberg and Steg (2007) assumed that crowdfunders are primarily motivated by altruistic and normative reasons or as Lehner (2013, p. 290) puts it “crowd investors typically do not look much at collaterals or business plans, but at the ideas and core values of the firm”. While the findings of this article do not rule out that crowdfunders are also motivated by the wish to support an altruistic idea, it seems that disclosure about the effects created by the implementation of this idea is not a precondition for their investments.

6. Conclusions

This article delivers first insights on the post-funding phase of crowdfunding for environmentally-oriented crowdfunding projects. It reveals that the money raised in crowdfunding for environmentally-oriented projects is used for implementing the measures advertised. However, it remains unclear whether this really comes along with the effects advertised during the crowdfunding campaign. Indeed, disclosure concerning the environmental effects achieved is very low and frequently only of qualitative nature. Thus, funders do not possess the necessary information to assess whether the environmental effects envisaged by the projects are actually realised. Agency theory was found to be an informative theoretical basis, concerning disclosure of environmental information in the post-funding phase of crowdfunding. In contrast, other assumptions of agency theory were not supported in this research. Based on agency theory, it could be expected that many entrepreneurs making use of crowdfunding follow a ‘take the money and run logic’. However, this was not confirmed as nearly all projects indeed used the funds obtained for the purpose advertised, even though they face little formal incentives to do so.

These insights gained within the scope of this article allow drawing practical implications for crowdfunders, entrepreneurs and regulators. Crowdfunders interested in the financial and

environmental effects of their investments are informed which factors foster the disclosure of the financial and environmental effects created by implementation. First, the results highlight that projects with longer durations of the loans are more probable to disclose information on the financial and environmental effects achieved in the post-funding phase. Second, crowdfunders primarily interested in the environmental effects of crowdfunding projects can learn that disclosure of these effects should not be taken for granted.

To convince crowdfunders with high levels of environmental interests, entrepreneurs are challenged to signal their ability and willingness to actually realize the environmental effects they are advertising during the crowdfunding campaign. Otherwise, they risk deteriorating funders' trust in crowdfunding as a mechanism to fund environmentally-oriented projects. One possibility to signal the ability and willingness to realize the environmental effects would be to voluntarily offer binding agreements, which would add a binding nature to the declarations of intent articulated by entrepreneurs during the crowdfunding campaign. The importance of signaling has already been highlighted with regard to other aspects of crowdfunding (e.g. signaling a project's quality, cf. Lehner, 2014).

Last, this article comes along with implications for regulation. With regard to financial effects, i.e. a context in which entrepreneurs (agents) need to fear sanctions if they do not deliver the returns, entrepreneurs disclose information on the realisation of the advertised returns to funders (principals). With regard to environmental effects, agents act less conform to their contract with principals, as they frequently do not disclose whether the environmental effects advertised in the prefunding phase are comprehensively realized. Thus, an underlying reason for the observed differences between the disclosure of financial and environmental effects of crowdfunding projects could be that fewer potential for sanctions exists with regard to environmental effects. Regulation concerning investor protection attributes investors' possibilities to secure the payment of financial returns (cf. Aschenbeck-Florange et al., 2013; Stemler, 2013; Zeco and Propfe, 2014). Therefore, to increase the contribution of crowdfunding to sustainable development, regulators could push entrepreneurs who advertise environmental effects during the crowdfunding campaigns to also document information on the realisation of such effects and grant investors the right to claim a comprehensive disclosure and realisation not only of financial, but also of environmental effects. Similarly, Zeco and Propfe (2014) highlight the low levels of requirements for public disclosure in sustainability-oriented crowdfunding and the relatively high levels of risk associated with fraud by entrepreneurs. Likewise, in the context of non-sustainability-related crowdfunding, Kshetri (2015) stresses the importance of a regulatory framework for crowdfunding. However, Zeco and Propfe (2014) also emphasize that legislation needs to avoid setting up inflexible and cost-ineffective rules, which might act as an undesired barrier to the further development of crowdfunding. This goes to show that regulation is challenged to follow a thin line which on the one hand prevents fraud, but on the other does not set unnecessary rules which might reduce the potential contribution of crowdfunding in financing environmental projects.

Besides these practical implications, this article also contributes to advancing the academic field of sustainability-oriented crowdfunding. It indicates in how far agency theory (Jensen and Meckling, 1976) can be an informative theoretical basis for analysing decision-making of funders as well as of entrepreneurs in sustainability-oriented crowdfunding. On the one hand, agency theory was found to be an informative theoretical basis concerning disclosure of environmental information in the post-funding phase of crowdfunding. As hypothesized based on agency theory, the disclosure of environmental information, which is not mandatory for agents and cannot be enforced by principals, is low. On the other hand, a key assumption of agency theory is not supported by this research. Based on agency theory, it could be expected that many entrepreneurs making use of crowdfunding follow a 'take the money and run logic'. However, this was not confirmed as nearly all projects used the funds obtained for the purpose advertised, even though they faced little formal incentives to do so. Thus, it appears that crowdfunding differs from other forms of financing, such as bank loans, for which stronger signs of opportunistic behaviour and 'take the money and run' logics have been found (e.g. Chen et al., 2008).

Furthermore, the article at hand identifies pathways for future research, which would also allow overcoming the limitations of this research. First, the analysis presented builds on a rather small, specific dataset. Thus caution needs to be taken when generalizing the results, particularly, as previous research on sustainability-oriented crowdfunding created partly differing insights depending on the geographic (i.e. Europe vs. USA) and thematic context (specific sectors vs. broad analyses) of the respective crowdfunding projects analysed (e.g. Hörisch, 2015; Calic and Mosakowski, 2016; Hörisch, 2018). Therefore, replications of this research in other than the German context and regarding other aspects of sustainable development than climate change are recommended.

Second, future research should explore the underlying reasons for the quantitative findings of this article. While this research found that most environmentally-oriented crowdfunding projects implement the climate-change related measure they advertised, it does not inform which contextual factors or project characteristics increase or decrease the probability of implementation. Future research could aim at identifying such characteristics. Agency theory for example assumes that the existence of repeated contracts decreases the likelihood of moral hazard (McAllister et al., 2008; Maestri, 2014). Another common method to address the problems highlighted by agency theory is signalling (e.g. Worsham and Gatrell, 2005; Djupdal and Westhead, 2015; Hahn et al., 2015). Therefore, future research could test, whether entrepreneurs who signal potential funders their ability to implement the respective project are indeed more likely to implement the measures advertised.

Another factor influencing the likelihood of implementation in the post-funding phase could be crowdfunding success in the pre-funding phase. Future research could therefore test whether environmentally-oriented crowdfunding projects which experience greater support by the crowd in the pre-funding phase, are more likely to be implemented in the post-funding phase.

Additionally, this article found that only few projects document whether they achieved their sustainability-related targets. However, it provides different possible explanations for this phenomenon, which cannot be tested based on the quantitative research design chosen. Further research should therefore include information on the individual funders and entrepreneurs in sustainability-oriented crowdfunding, to investigate whether entrepreneurs are reluctant to document the realisation of environmental effects advertised during the crowdfunding campaign because they fear negative consequences of providing detailed information, or whether crowdfunders might simply not request disclosure of the environmental effects realised. For instance, qualitative research could draw on interviews with funders and entrepreneurs to clarify which of the above reasons is more accurate or whether maybe both reasons for non-disclosure contribute to the explanation of non-disclosure of environmental effects in crowdfunding to a certain degree. Such research could also help to evaluate whether the projects actually realised the environmental effects advertised but fall short in disclosing this achievement or whether they failed to comprehensively realise the envisaged

environmental effects and are hence reluctant to disclose information on the environmental effects created.

Overall, the results of this research, do not provide indication that environmental entrepreneurs making use of crowdfunding employ a 'Take the money and run'-strategy. In contrast, it is found that nearly all successfully funded projects indeed implement the measures advertised to their funders. However, deficits are revealed concerning the disclosure of the environmental effects coming along with such implementation. Therefore, the post-funding phase in environmentally-oriented crowdfunding can currently rather be described with 'Take the money and implement, but do not disclose' than with 'Take the money and run'.

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